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AN EXPERIMENTAL STUDY OF LITERARY VS. SCIENTIFIC TYPES¹

By GARDNER MURPHY

The experiment here described had as its main objective the discovery of differences between subjects having a predominant interest in and aptitude for literature, and those having a predominant interest in and aptitude for science. In particular, it sought to discover diagnostic characteristics,—traits which invariably belong to one or the other group, and to its members only, so that the application of the test to a given subject would make possible, to some degree, a determination of his aptitudes. It was also hoped that the experiment would show certain well-defined differences between persons chiefly interested in aesthetic and emotional activities and persons chiefly interested in factual and practical activities. The study of this problem was in the main sacrificed to that of the first. Probably the data given by the experiment would help to answer both questions and several more, but only a small part of those data has been adequately studied. The results which are given by such experimentation seem to justify an intensive study rather than a superficial survey of the whole field.

The entire experimental work was done with the word-association test. The list used was the first hundred words of the Wells-Woodworth standard series,² printed with the usual spaces for entering data. The only other materials needed were stop-watch and pen and ink.

The procedure was as follows. When the subject had taken his seat on the opposite side of the table from the experimenter, he was given the following instructions: "I am going to pronounce a series of one hundred words. After each word please give the word which first comes to you, as quickly as possible. For example, if I should say *tennis*, you might immediately say *golf* or *racquet*. Only one word is desired, and it should be given as soon as possible after my word, without deliberation. If there is difficulty in hearing or un-

¹ An investigation carried out in the Yale Psychological Laboratory as part of the work in the advanced laboratory course, for seniors.

² Psychological Review, Monograph Supplement, Vol. 13, 1910-11.

derstanding any word, please let me know, and I will come back to it later. The eyes should be kept closed throughout the experiment. There will be a series of ten practice words before the actual experiment is begun. Is that all perfectly clear?" After any necessary explanations, the practice series was given, and the subject was asked for introspections. The experiment-series was then begun. The experimenter's eyes were on the stop-watch except while he was recording answers and association-times, for it was found more accurate to watch the continuously moving hand than to start and stop the watch for each word. The time recorded was the interval between the end of the stimulus-word and the beginning of the associate, measured in fifths of a second. If the subject gave no associate in five seconds, the word was passed; if he failed on several repetitions of the same stimulus (with other words intervening) it was called a failure. In computing averages of times, failures are classed as 25 (5 seconds). After completion of the series, introspections were called for, both for the experience as a whole, and for particular words whose introspective explanation seemed of peculiar value. The second trial was held at the end of an interval averaging forty days. The effect of variation in the length of the interval will be discussed later. The second trial differed from the first in that the instructions and practice series were omitted, the subject being asked simply whether he recalled the instructions, and helped out if he had partly forgotten them. It seemed sufficient if the subject remembered that he was to give the first word that came to him, without deliberation, and that he was to keep his eyes closed. Introspections were again asked for.

The subjects were forty in number,—twenty-seven seniors in Yale College, and thirteen members of the faculty. Of the students, eight were specializing in literature, nine in science, and ten in other subjects. They were, moreover, classified in five groups according to my estimate of their aptitudes and interests,—Group 1 those of the decidedly aesthetic and emotional type, Group 5 those of the decidedly practical type, with the other groups intermediate. The estimates were of course made before experimentation. They are far from infallible; but I have known these men intimately, and a friend's estimate is probably worth more than the fact that they were specializing in given branches of the curriculum. In some cases I asked the men how they would classify themselves, and took their answers into account in my decision. As a matter of fact only one subject "majoring" in literature was

put into the scientific end of the spectrum, and none "majoring" in science were transferred from that end. Of the members of the faculty, five were professors of English literature; eight were professors of science, distributed as follows: Anthropology, 1; Biology, 2; Chemistry, 1; Geology, 1; Mathematics, 1; Physics, 1; Psychology, 1. The professors of English I called Group L, the professors of science, Group S. I decided that there were so many ways in which the types might be studied that it would be well to pick out a small group of decided representatives of the two types, so that I could tell whether it would be worth while to apply a given method to the results of the whole forty;³ for if positive types gave no valuable results, it seemed unlikely that less pronounced types would do so. These two special groups were composed of five members each, four members of the faculty and a student of unquestionably pronounced tendencies,—in the one case a man of very unusual literary capacity and feeling, in the other a very brilliant student of science. The literary group was called Group A; the scientific, Group B. The subjects are referred to throughout by initials.

Though the method of association-times did not seem promising, I thought it worth while to compare Groups A and B by this method. The results were as follows:

Gr. A	Av. time in 5ths		Im- prove- ment		Gr. B	Av. time in 5ths		Im- prove- ment
	Trial 1	Trial 2				Trial 1	Trial 2	
J.C.A..	4.74	4.29	9.5%		G.A.B..	8.64	7.27	15.9%
T.B....	9.02	5.76	36.1%		H.A.B..	5.05	3.58	29.1%
L.S.M..	6.31	6.02	4.6%		R.C.T..	5.99	4.52	24.5%
W.L.P..	5.17	4.84	6.4%		W.A.W..	6.61	4.66	29.5%
C.B.T..	5.67	5.08	14.1%		L.L.W..	6.60	5.63	14.7%
Av...	6.18	5.20	15.9%		Av...	6.58	5.13	22.0%

These figures justify no conclusions as to differences between the types, since the group-averages are so nearly equal. The scientific group shows greater improvement, but with T.B. showing more than any subject in group B, and W.L.P. and C.B.T. so nearly equal to L.L.W. and G.A.B., respectively,

³ Several methods were so applied. Data from thirty-seven subjects are used; but the results from the three members of Group 3, the men whose tendencies in the two directions seemed about equal, were not significant enough to warrant inclusion here.

we obviously have no diagnostic characteristic. The results did not seem to justify the application of this method to the other subjects.

An investigation to discover whether there were marked differences between the groups in the number of *repetitions* (of the *same associate* to a *given stimulus* as it appeared in the two trials) gave the following results. (Changes from singular to plural in nouns, and vice versa, and changes from present to past tense in verbs, and vice versa, were counted as repetitions; otherwise only exact reproductions were allowed.)

Group A		Group B	
J.C.A.	32	G.A.B.	41
T.B.	38	H.A.B.	56
L.S.M.	21	R.C.T.	31
W.L.P.	39	W.A.W.	47
C.B.T.	50	L.L.W.	50
Av.	36	Av.	45

Here we have a distinct difference in the group-averages; and also, if we take our total average, 40.5, we find that four of Group B fall above it, and four of Group A below it. With only two atypical subjects out of ten, the method seemed to deserve application to the remaining subjects,—that is, to Groups L, 1, and 2, on the literary side, and Groups S, 4 and 5 on the scientific side, omitting those subjects who are also members of Groups A and B, and have been studied as such. The results:

Literary		Scientific	
M.J.B.	28	R.P.A.	43
D.N.B.	38	J.B.	39
J.M.B.	41	H.H.B.	48
J.S.B.	28	H.C.B.	24
E.R.B.	48	A.R.F.	43
F.W.L.	30	M.H.	39
B.S.	38	D.U.H.	43
C.R.W.	27	A.G.K.	45
	—	F.K.	36
Av.	33.9	Av.	38.9

Here we have results of the same character, though not quite so pronounced. Before drawing conclusions, however,

I wanted to make sure that the varying interval between trials was not vitiating the significance of my results. A comparison of the five subjects having the longest interval with the five having the shortest interval gave these data:

Five longest	Period	Number repeated	Five shortest	Period	Number repeated
E.S.R.....	53 days	42	H.C.B.....	31 days	24
B.S.....	53 days	38	R.W.W....	31 days	31
S.A.T.....	52 days	33	J.W.F.....	29 days	32
A.R.F.....	50 days	43	D.U.H....	28 days	43
M.J.B.....	49 days	28	E.N.L.....	26 days	45
Av.....	51.4 days	36.8	Av.....	29 days	35

The average repetition is slightly *greater* when the period averages nearly *twice as long*. Since the individual variation is more than great enough to balance what losses take place in the interval from 29 to 51.4 days, such losses cannot be considerable. Returning to the results of the repetition-study, I think we are justified in concluding that the scientific subjects tend as a group to repeat a larger number of associates, but the intra-group variation is so large, and so many subjects are atypical, that we have no reliable diagnostic test herein. Of the 27 subjects studied in the latter comparison 18 were typical, 9 atypical. It will be remembered that the former comparison (Groups A and B) gave 8 typical to 2 atypical.

In the Kent-Rosanoff experiment,⁴ tables were compiled showing the number of subjects giving each reaction-word which was associated with each stimulus. It seemed possible that the groups might vary in "community,"—that one group might give more commonplace words than the other, one group choosing obvious associates, the other abstruse associates. For this comparison I used the ten Kent-Rosanoff stimulus-words which appear in my hundred words from the Wells-Woodworth series. Using the results of both trials, I had thus 20 associates for each subject. The figures used in the Kent-Rosanoff experiment to measure community were the number of subjects out of a thousand who gave a particular associate to a given stimulus. The averages and medians⁵ given below are derived simply from these figures for the twenty associates given.

⁴ American Journal of Insanity, Vol. 67, 1910.

⁵ The median is half the sum of the tenth and eleventh numbers.

Group A			Group B		
Subject	Average	Median	Subject	Average	Median
J.C.A.....	28.98	154	G.A.B.....	31.24	90
T.B.....	24.94	22.5	H.A.B.....	40.97	173
L.S.M.....	16.93	26.5	R.C.T.....	29.44	59.5
W.L.P.....	24.78	55.5	W.A.W.....	37.97	166
C.B.T.....	30.17	42.5	L.L.W.....	39.13	166
Av.....	25.16	60.2	Av.....	35.75	131

Here we have a decided difference between groups, the difference being more apparent by using medians. Taking the median⁶ of the ten subjects' medians, or 74.8, and comparing each subject with this, we find eight typical, two atypical. This method was applied to the other subjects, with these results:

Average of "medians of community" for

10 literary subjects.....	72.65
17 scientific subjects.....	90.03

The same difference is apparent, but is not large enough to be conclusive. A good deal of study of this problem by different combinations of averages and medians showed throughout an unsatisfactorily small margin. For example:

Average of "average of community" for

10 literary subjects.....	22.9
17 scientific subjects.....	26.3

On the whole, I think it probable that we have here an indication of the same tendency that was so pronounced in the case of Groups A and B, but we cannot be positive, and we certainly have not a good diagnostic test. Another way of studying community was to count the number of individual words which were used by the groups in answer to each stimulus;—if all five members of Groups A and B give the same associate, we count one; if all gave different associates, we count five. So the group having the smaller total for the hundred words will have the larger community within itself,—i. e., less variation. Using the data of trial 1, this comparison gave the literary group 405, the scientific group 378. Again a larger scientific "community." All the evidence seems to be of the same kind, yet it is inconclusive. Taking this problem as a whole, I think we may say that a tendency to greater commonplaceness of associates on the part of the scientists is "highly probable."

⁶ Half the sum of the fifth and sixth numbers.

Closely connected with the preceding comparison is the number of "individual reactions,"—associates not given by any other subject. This would mean of course, in my experiment, associates which do not appear at all in the Kent-Rosanoff tables. Group A gave 21 such associates, Group B gave 9. The 10 remaining literary subjects gave 29, or an average of 2.9; the 17 remaining scientific subjects gave 46, an average of 2.7. Again the results from the larger groups are not as positive in their indication of differences as are those from Groups A and B,—though similar in kind. *Probably* the literary subjects tend to more individual reactions,—a result in harmony with the conclusions as to "community."

We come now to classifications of the associations, and problems connected therewith, a much more hopeful, as also a much more difficult task. First, as to grammatical considerations pure and simple. Wreschner,⁷ and more recently Sutherland,⁸ have used the method of classifying associations on the basis of the parts of speech to which stimulus and associate belong. Since all the stimuli in my list fall under the heads *noun*, *adjective*, *verb*, and *adverb*, and answers may be in any of the parts of speech, I have thirty-two classes, as shown below. Three notes are necessary to an understanding of the classification. (1) There are in my list 58 nouns, 20 adjectives, 20 verbs, and 2 adverbs. (2) Some of the stimuli which are commonly used as nouns were apperceived by the subjects as verbs. My classification is on the basis of the way the subject apperceived them. A few cases leave this an open question, but they are so few as to allow no chance for serious error. (3) Where the totals do not equal 100, the difference is the number of the subject's failures. The following is a typical classification.

W.L.P. TRIAL 1

Stimulus	Associates							
	Noun	Adj.	Verb	Adv.	Pron.	Prep.	Conj.	Intj.
Noun.....	49	4	2	..	..	..	..	..
Adjective.....	6	16	..	..	..	..	..	..
Verb.....	8	1	11	1	..	..	..	..
Adverb.....	1	..	..	..	..	..	1	..

If we start at the upper left hand corner and read down and to the right along a diagonal (49-16-11), we shall have the

⁷ Zeitschrift für Psychologie und Physiologie der Sinnesorgane; Ergänzungsband III, Theil 1 u. 2.

⁸ Sutherland, A. H., A Critique of Word Association Reactions. 1913, Menasha, Wis., Geo. Banta Pub. Co.

symmetrical associations, where stimulus and associate are members of the same part of speech. Now compiling such tables for Groups A and B for the first trial, we have:

Group A. Averages									
Stimulus	Associates								Totals
	Noun	Adj.	Verb	Adv.	Pron.	Prep.	Conj.	Intj.	
Noun.....	51.2	2.4	3.0	....	....	.2	....	....	56.8
Adjective....	6.0	14.2	.8	....	....	....	....	....	21.0
Verb.....	6.0	1.4	10.0	.8	....	....	....	....	18.2
Adverb.....	.2	....	.4	1.8	....	....	.2	....	2.6
Totals....	63.4	18.0	14.2	2.6	....	.2	.2	....	98.6
Total symmetry, 77.2; symmetry varies from 69 to 82									

Group B. Averages									
Stimulus	Associates								Totals
	Noun	Adj.	Verb	Adv.	Pron.	Prep.	Conj.	Intj.	
Noun.....	46.2	5.8	1.8	.2	....	....	....	.2	54.2
Adjective....	4.4	15.4	.2	.4	....	....	....	....	20.4
Verb.....	8.2	2.6	11.0	.6	....	....	....	....	22.4
Adverb.....	....	....	....	1.6	....	....	.2	....	1.8
Totals....	58.8	23.8	13.0	2.8	....	....	.2	.2	98.8
Total symmetry, 74.2; symmetry varies from 60 to 87									

This is of course enough to show that symmetry is not a diagnostic character. But some of the grammatical relations show enough difference between the groups to justify further work with this method. I therefore added the results of trial 2 for Groups A and B, taking the *totals* for *each class* of association.

Group A									
Stimulus	Associates								
	Noun	Adj.	Verb	Adv.	Pron.	Prep.	Conj.	Intj.	
Noun.....	521	18	23	..	..	1	..	..
Adjective.....	73	123	4	..	..	..	..	..
Verb.....	98	13	87	8	..	..	..	..
Adverb.....	2	1	3	11	..	..	2	..	
Group B									
Stimulus	Associates								
	Noun	Adj.	Verb	Adv.	Pron.	Prep.	Conj.	Intj.	
Noun.....	455	61	23	2	..	..	..	2	
Adjective.....	38	164	2	3	..	..	..	..
Verb.....	68	19	126	7	..	..	..	..
Adverb.....	..	..	2	15	..	1	2	..	

We have here three well-defined differences. (1) When nouns are stimuli, the scientific group gives a very much larger number of adjective-answers than does the literary group; the proportion of noun-adjective to noun-noun associations is for the scientists 61/455, or 13.4%; for the literary people, 18/521, or only 3.5%. (2) When adjectives are given as stimuli, both groups give more adjective-answers than noun-answers, but the proportions are strikingly different; for the literary subjects there are 59.3% as many adjective-noun as adjective-adjective associations, for the scientists, 23.2%. (3) When verbs are stimuli, the literary subjects give slightly more noun-answers than verb-answers, while the scientific subjects give nearly twice as many verbs as nouns, the proportions of verb-noun to verb-verb associations being 112.6% and 54%, respectively. These figures are much more promising for the purposes of a search for diagnostic characters. I decided to apply each of these three criteria to each member of Groups A and B, to find out whether the variation within the groups was so large as to vitiate the significance of the totals. I counted a subject typical in those characteristics in which his percentage approximated his group average, atypical in those in which he was nearer the average of the other group. In order to have exact standards to judge by, I called a subject undecided (marked with a dash—) if there was a difference of less than 5 between his percentage and the percentage marking the *geometrical mean* between the averages of the two groups, typical if his percentage varied by more than 5 from this mean in the direction of his group, atypical if he varied by more than 5 in the opposite direction. For example, if Group A had a percentage of 15 in a given proportion of two kinds of associations, and Group B had a percentage of 60, a member of Group A would be called typical if his percentage were between 0 and 25, undecided if between 25 and 35, atypical if above 35. This method gave the following results. (t=typical, a=atypical.)

	Group A			Group B		
	Noun-stim.	Adj.-stim.	Verb-stim.	Noun-stim.	Adj.-stim.	Verb-stim.
J.C.A. . . .	—	a	a	G.A.B. . . .	t	a
T.B.	t	t	—	H.A.B. . . .	a	t
L.S.M. . . .	t	t	t	R.C.T. . . .	t	a
W.L.P. . . .	—	t	t	W.A.W. . . .	t	a
C.B.T.	t	a	t	L.L.W. . . .	a	t

This means that every subject except J.C.A. has a majority of the typical characteristics of his group. In other words,

if we used these three criteria on subjects unknown to us, we could at this rate diagnose correctly in nine cases out of ten. Of course a failure in one case means that we have not a perfect test. J.C.A. is not a decided type, as he has a great interest in physics, and in scientific and factual things in general, but this is of course rather a lame excuse. The fact that the test works in nine cases means, however, that we have a good working-basis for a thorough-going diagnostic test. And there is no question that we have general tendencies here which are very pronounced, as the totals showed. If time had allowed, I think this method would have merited further study.

The customary classification of word-associations has been confined to from five to fifteen *classes*,—all the rest being called “miscellaneous.” One classification gave 44% of the associates as “miscellaneous.” Even Miss Fürst’s classification,⁹ which is as far as I know the most thorough-going yet made, gives only 15 classes, and the Wells-Woodworth classification¹⁰ gives only five, with one of these subdivided into five. The usual classification is something like this:

1. Definition.
2. Predicate adjective.
3. Subordination.
4. Supraordination.
5. Speech-habit.
6. Defective reactions.
7. Miscellaneous.

In view of the vast number of possible ways of associating words, such a classification must throw into its last category not only many associations, but many *groups* of associations, coördinate with those given, and often equally, or nearly equally, important. It seems to me that the *large number of miscellaneous associations* is not due entirely to the *difficulty of deciding* where to put the associations, but in part to the *failure to separate* perfectly clear-cut classes as such, and to treat them as a part of the material used in computing results. For example, the association *lion-tiger* is common and normal; why should we call it “miscellaneous” any more than *lion-animal*, which we call “supraordination?” Accordingly, some classifiers have added the class “coördination” to include such associations. It seems to me that an extension

⁹ In article by Jung, American Journal of Psychology, Vol. 21, April, 1910.

¹⁰ Psychological Review, Monograph Supplement, Vol. 13, 1910-11.

of this principle will make the association-test a good deal more useful. The task is to make the new classes and add them on, cutting down the miscellaneous group. This does not mean necessarily the grouping of any associations whose true category is *questionable*; it means only that the groups which *are* definite be labeled and defined as separate groups. There will of course always be a miscellaneous group, because there are always associations which may have come about by any one of two or more associative processes. The classifier must be ready to put associations into this class if their nature is open to serious question. It is well to have two or more persons classify the results, and throw out those associations about which there is disagreement. But where the true category is not open to serious question, I would make the classes as many in number as need be to classify all answers which *can* be accurately classified.

Accordingly I set out to make a new classification. I shall first give it as it stands¹¹ entire, and then explain it, in so far as a thing so fearfully and wonderfully made can be explained.

I. Meaning-associations.

1. Contiguity.¹²

A. Spatial.

- a. Contiguity of separate things: bottle-cork, burglar-window.
- b. Selection of part of situation presented by stimulus: bottle-neck, cap-lining.
- c. Enlargement of situation presented by stimulus: table-room, blood-wound.
- d. Locating the situation presented by stimulus: omelet-Commons, music-Woolsey.¹³

B. Temporal.

- a. Contiguity of two concepts, neither containing an idea of time, but associated by time-contiguity: death-doctor, dismay-disaster.
- b. Association of a concept with a time-idea.
 - a. Locating in time the situation presented by stimulus: gift-Christmas, fish-Friday.
 - b. Naming of a situation appropriate to a time-idea in the stimulus: occasion-speech, night-steal.

¹¹ Following the name of each class. I give two illustrations, with a brief explanation in a foot-note, where this seems necessary. The illustrations are from the actual data of the experiment, where these could readily be found.

¹² Of course this refers to contiguity *within the situation* indicated by the pair, not to the psychological origin of the association. In the same way, Class 3, "opposites" is not meant to imply that this form of association is not reducible to a simpler form; and so on with the rest of the classes.

¹³ Refers to Woolsey Hall.

2. Similarity.
 - A. Synonyms.
 - a. Exact: snake-serpent, purpose-aim.
 - b. Approximate.
 - a. Same part of speech and coordinate in extension:¹⁴ delicate-fine, prefer-choose.
 - b. Same part of speech, but not coordinate in extension.
 - . Increased extension:¹⁵ indecent-bad, crime-harm.
 - =. Decreased extension:¹⁶ prospect-landscape, true-straight.
 - c. Different part of speech; expensive-cost, end-last.
 - B. Members of a class having a quality in common: produce-concoct, tiger-lion.
 - C. Meanings more distantly related but distinctly similar: thick-heavy, dark-black.
 3. Opposites.
 - A. Exact: expensive-cheap, rich-poor.
 - B. Approximate:¹⁷ unfair-justice, unseen-visible.
 4. Members of a common pair, not opposites.
 - A. Associated by contiguity:¹⁸ lightning-thunder, tar-feathers.
 - B. Associated by similarity: man-woman, eating-drinking.
 5. Subordination: instrument-flute, satisfy-pay.
 6. Supraordination: cedar-tree, nourish-provide.
 7. Cause and effect.
 - A. Reaction-word denoting cause: stretch-tired, indecent-exposed.
 - B. Reaction-word denoting effect: pinch-scream, bashful-blushing.
 8. Particular person or thing as representative of a general idea.¹⁹
 - A. When stimulus is a noun:²⁰ music-piano, ham-Armour.
 - B. When stimulus is an adjective:²⁰ tough-beef, perverse-devil.
 - C. When stimulus is commonly used as a noun, but used by the subject as though it were an adjective: ham-omelet, hip-joint.
 9. General idea of which a particularized stimulus is representative (reverse of 8): acid-chemistry, fish-Christianity.
 10. Substance of which stimulus is composed:²¹ omelet-egg, rope-strands.

¹⁴ "Coordinate in extension" signifies that neither term includes the other.

¹⁵ "Indecent" is a kind of "bad"; "bad" has greater extension.

¹⁶ "Straight" is a kind of "true"; "true" has greater extension.

¹⁷ Where association is by opposites, but the meanings are not exact opposites.

¹⁸ Lightning and thunder are so intimately associated as to be a "familiar pair associated by contiguity."

¹⁹ General idea "music" makes the subject think of a particular thing representative of it.

²⁰ There seems to be no great difference between 8A and 8B psychologically.

²¹ Construed rather broadly.

11. Noun-stimulus delimited by
 - A. Adjective:²² mountain-bald, house-white.
 - B. Participle: ham-hanging up, burglar-caught.
 - C. Noun used as adjective: instrument-drawing, wagon-delivery.
12. Adjective-stimulus delimited by adverb: good-very, perfect-absolutely.
13. Verb-stimulus delimited by adverb: discourse-fluently, follow-near.
14. Selection of essential attribute of stimulus.²²
 - A. In adjective-reaction: tar-thick, mischief-bad.
 - B. In noun-reaction: table-flatness, night-darkness.
 - C. In participle-reaction: rope-twisted, tank-drunk.
15. Stimulus as subject of reaction-verb: lightning-strike, fish-swim.
16. Stimulus as object of reaction-verb.
 - A. Direct object: fish-catch, umbrella-raise.
 - B. Cognate accusative: gift-give, ditch-dig.
17. Stimulus as object of action shown by naming agent: house-breaker, school-visitor.
18. Stimulus verb with reaction as object.
 - A. Direct object: smoke-cigarette, drink-water.
 - B. Cognate accusative: dig-trench, run-race.
19. Stimulus-verb with reaction as subject: nourish-food, drift-snow.
20. Action appropriate to situation denoted by stimulus.
 - A. Reaction in the form of a verb: prospect-look, lecture-listen.²³
 - B. Reaction in the form of a noun: death-despair, grocery-orders.
21. Thing appropriate to situation denoted by stimulus; salute-cap, drive-whip.
22. Reversal of point of view in verb-action:²⁴ satisfy-enjoy, enjoy-please.
23. Translation into other languages: sailor-matelot, overcoat-Überrock.
24. Reaction as the subject of action *implied* in noun-stimulus: instrument-engineer, dismay-man.
25. Situation appropriate to action denoted by stimulus:²⁵ ride-trolley, salute-battery.
26. Adverb stimulus modifying verb-reaction: again-ran, also-followed.
27. Adjective-reaction referring to same situation as adjective-stimulus: dark-cold, deep-salt.

²² Since *some* houses are *not* white, the subject is delimiting his stimulus; but since *all* tar is thick, he is in this case not delimiting it, but selecting an essential attribute.

²³ When there is a lecture one (usually) listens; the two are almost a plain case of contiguity, but I preferred a separate class for such characteristic reactions.

²⁴ If A satisfies or pleases B, B enjoys it. We simply change our point of view.

²⁵ *Battery* is not the direct object of *salute*, but it is the situation in which the subject was used to saluting.

- 28. Stimulus as source of reaction: tree-sap, grocery-provisions.
- 29. Reaction as source of stimulus: ham-pig, rain-clouds.

II. Pure verbal associations.

- 1. Word-contiguity.
 - A. In associated order.
 - a. Completion of phrase: snake-charmer, glory-hallelujah.
 - b. With intermediate words omitted: exchange-robbery,²⁶ captain-soul.
 - B. In reversed order.
 - a. Completion of phrase: cover-under, path-tow.
 - b. With intermediate words omitted: lamb-Mary, burning-boy.
- 2. Words of a common class:²⁷ also-not, again-since.
- 3. Sound-similarity.
 - A. Reaction beginning with same sounds: produce-procure, also-allow.
 - B. Reaction ending with same sounds.
 - a. Rhymes: hash-dash, rich-ditch.
 - b. Others: occasion-vocation, scramble-humble.
 - C. Other sound-similarities: barrel-arrow, elephant-aliment.

III. Unclassified: barrel-song, hip-gun.

Note 1. I have had to give much thought to the question of "logical" vs. "psychological" classification. I think the dilemma is often represented as worse than it really is, but there is nevertheless a real dilemma;—if we classify "logically," we may miss a great part of the psychological significance of the results; if we classify "psychologically" the large personal equation of the classifier comes in, and he may grossly misconstrue his material, so as to get meanings which are the fabric of his own rather than of the subject's mind. I think part of the trouble is due, however, to a confusion of a *classification of logical relations* and a *logical classification of psychological relations*. I have tried to work out the latter in detail (hence the sub-heads, etc.); and I have attempted to remove the danger of the personal equation (and of false classification) by allowing a large unclassified group,—cases, in which, to use my previous phraseology, the true classification was open to serious question.²⁸ This group also includes the reactions which are obviously reverberation-effects or answers to previous stimuli, as I classified in each case on the basis of the relation of the reaction-word to its stimulus.

²⁶ "Fair exchange is no robbery."

²⁷ The subject seems to think of the stimulus as a short common particle, not as a meaning.

²⁸ Whether I have made this group large enough is nevertheless a real question. As I look over the illustrations given after each class, as compiled six months ago, I find some which seem to me quite capable of different interpretations. Some of those, however, which appear doubtful, were rendered fairly certain by the introspections.

Note 2. Where it is not specified whether stimulus or associate is referred to, the latter is to be understood; e.g., "8, particular thing as representative," etc., "*reaction-word* denotes a particular thing," etc.

Note 3. I tried to follow some kind of system in the order of classes in "I. Meaning-associations," and did so up to No. 23; the other classes were added one by one, as members appeared during the work.

Note 4. Of course the classification does not claim to be complete. It aims only to cover all the classifiable associations in *this experiment* with *these subjects*. In fact, I often saw where there were possible associates falling under classes or sub-classes in which no actual associates were given. It is distinctly a tentative list, and is offered as a suggestion. I am certain that it contains many imperfections, and hope that it will be critically tested and amended.

Note 5. By "meaning-associations" I designate associations in which the meaning of the two words is the reason for their association, as distinct from their form as words. They are immensely in the majority. Where the *words as such*, not their meanings, are associated, I call the process pure verbal association. For example, to the stimulus "watchful" the answer "shepherd" is an illustration of the former; "waiting," of the latter. All of the "verbo-motor" category belong, of course, under my second main division, but I did not designate such a class, because it seemed impossible to tell whether the association of two words in this way is really motor. A good many subjects get visual images, and it is quite possible that these determine the associations. If the classifier means by "verbo-motor" simply that one word as such (not a meaning) causes the pronouncing of another, there is no difference between the old classification and the new except that the new one is subdivided into several classes. I think, however, that the "verbo-motor" category has usually meant simply "speech-habit." And I do not see how any one can be sure that such an association as *merry-widow*, for example, is not as much due to seeing the words together as to pronouncing them together. I think it is a mistake to allow any words in the "verbal" group unless it is certain that they are due to such purely verbal associations, for many an apparent verbal association may be improvised as a meaning-association. I decided, therefore, (1) to class words on their meaning-relation where that seemed of primary importance in the actual determination of the answer which the subject gave, (2) to class them as verbal associations when, and only

when, they showed distinct evidence of such character, (3) to allow a large unclassified group for words as to whose true status I was uncertain. E. g., *black-white* would be classed as a meaning-associate, in spite of some probable pure-verbal quality; *watchful-waiting* would count as a verbal association, while *crime-punishment* would be unclassified.

Note 6. It will be observed that the classification aims to consider always what is in the subject's mind, in so far as this can be ascertained. Introspections were of course of great help in some cases where the relation of the two words was obscure. Since the classification aims in this way to be "psychological," I have not hesitated to use the word "situation" in the sense of the whole mass of imagery which the stimulus brings to the subject's mind. I hope that the word has not been used too loosely, and that I have not supposed there were given elements in the "situation" unless I had evidence for it.

I first took the reactions which the subjects of Groups A and B gave on both their trials, i. e., the "perfect reproductions" (allowing, as before, changes in tense and number), about 10×40 , or 400 associations.²⁹ I thought these would probably be more sure to be typical of the subjects. The results are given in the following chart.

The results show definite differences between the groups in the following respects:

(1) The number of associations by contiguity is much larger for the literary subjects, the totals being 30 to 17; though the "contiguity of separate things" shows a slight advantage for Group B, it is more than balanced by the other three classes.

(2) Group B shows many more associates which are "members of a class having a quality in common with the stimulus," the comparison giving them 24 to Group A's 10.

(3) Group B has over twice as many opposites, having 46 to Group A's 19 exact ones, and 5 to Group A's 1 approximate one, or a total of 51 to 20.

(4) "Members of a common pair associated by similarity" show 26 for Group B, 7 for Group A.

(5) Literary subjects show not a single associate delimiting a noun-stimulus, while scientific subjects show 6.

(6) Group A has 10 associates which name the object of a stimulus-verb; Group B has but 4.

(7) Group A has only 1 "word-contiguity" association; Group B has 10.

²⁹ Actually a few less, on account of failures.

		GROUP A						GROUP B					
		J.C.A.	T.B.	L.S.M.	W.L.P.	C.B.T.	Totals	G.A.B.	H.A.B.	R.C.T.	W.A.W.	L.L.W.	Totals
I	1	A { a	1	3	1	2	7	3	1	.	5	.	9
		B { b	2	5	3	3	15	4	1	1	.	2	8
		C { c	1	1	1	2	5	.	.	.	.	.	0
		D { d	1	3	1	2	7	.	.	.	.	.	0
		E { e	1	1	1	1	4	.	.	.	.	.	0
		F { f	1	1	1	1	4	.	.	.	.	.	0
		G { g	1	1	1	1	4	.	.	.	.	.	0
		H { h	1	1	1	1	4	.	.	.	.	.	0
		I { i	1	1	1	1	4	.	.	.	.	.	0
		J { j	1	1	1	1	4	.	.	.	.	.	0
	2	A { a	3	3	4	6	16	1	6	1	4	4	15
		B { b	1	7	2	2	18	2	1	2	3	4	10
		C { c	1	1	1	1	4	1	1	1	1	1	8
		D { d	1	1	1	1	4	1	1	1	1	1	0
		E { e	1	1	1	1	4	1	1	1	1	1	0
		F { f	1	1	1	1	4	1	1	1	1	1	0
		G { g	1	1	1	1	4	1	1	1	1	1	0
		H { h	1	1	1	1	4	1	1	1	1	1	0
		I { i	1	1	1	1	4	1	1	1	1	1	0
		J { j	1	1	1	1	4	1	1	1	1	1	0
	3	A { a	3	2	4	1	10	5	16	7	9	9	46
		B { b	2	1	1	2	6	3	1	4	3	6	26
		C { c	2	1	1	2	6	1	1	2	1	1	6
		D { d	2	1	1	2	6	1	1	2	1	1	6
		E { e	2	1	1	2	6	1	1	2	1	1	6
		F { f	2	1	1	2	6	1	1	2	1	1	6
		G { g	2	1	1	2	6	1	1	2	1	1	6
		H { h	2	1	1	2	6	1	1	2	1	1	6
		I { i	2	1	1	2	6	1	1	2	1	1	6
		J { j	2	1	1	2	6	1	1	2	1	1	6
II	1	A { a	1	1	1	1	4	1	1	1	1	1	5
		B { b	1	1	1	1	4	1	1	1	1	1	5
		C { c	1	1	1	1	4	1	1	1	1	1	5
		D { d	1	1	1	1	4	1	1	1	1	1	5
		E { e	1	1	1	1	4	1	1	1	1	1	5
		F { f	1	1	1	1	4	1	1	1	1	1	5
		G { g	1	1	1	1	4	1	1	1	1	1	5
		H { h	1	1	1	1	4	1	1	1	1	1	5
		I { i	1	1	1	1	4	1	1	1	1	1	5
		J { j	1	1	1	1	4	1	1	1	1	1	5
	2	A { a	1	1	1	1	4	1	1	1	1	1	5
		B { b	1	1	1	1	4	1	1	1	1	1	5
		C { c	1	1	1	1	4	1	1	1	1	1	5
		D { d	1	1	1	1	4	1	1	1	1	1	5
		E { e	1	1	1	1	4	1	1	1	1	1	5
		F { f	1	1	1	1	4	1	1	1	1	1	5
		G { g	1	1	1	1	4	1	1	1	1	1	5
		H { h	1	1	1	1	4	1	1	1	1	1	5
		I { i	1	1	1	1	4	1	1	1	1	1	5
		J { j	1	1	1	1	4	1	1	1	1	1	5
	3	A { a	1	1	1	1	4	1	1	1	1	1	5
		B { b	1	1	1	1	4	1	1	1	1	1	5
		C { c	1	1	1	1	4	1	1	1	1	1	5
		D { d	1	1	1	1	4	1	1	1	1	1	5
		E { e	1	1	1	1	4	1	1	1	1	1	5
		F { f	1	1	1	1	4	1	1	1	1	1	5
		G { g	1	1	1	1	4	1	1	1	1	1	5
		H { h	1	1	1	1	4	1	1	1	1	1	5
		I { i	1	1	1	1	4	1	1	1	1	1	5
		J { j	1	1	1	1	4	1	1	1	1	1	5
III	1	A { a	1	1	1	1	4	1	1	1	1	1	5
		B { b	1	1	1	1	4	1	1	1	1	1	5
		C { c	1	1	1	1	4	1	1	1	1	1	5
		D { d	1	1	1	1	4	1	1	1	1	1	5
		E { e	1	1	1	1	4	1	1	1	1	1	5
		F { f	1	1	1	1	4	1	1	1	1	1	5
		G { g	1	1	1	1	4	1	1	1	1	1	5
		H { h	1	1	1	1	4	1	1	1	1	1	5
		I { i	1	1	1	1	4	1	1	1	1	1	5
		J { j	1	1	1	1	4	1	1	1	1	1	5
	2	A { a	1	1	1	1	4	1	1	1	1	1	5
		B { b	1	1	1	1	4	1	1	1	1	1	5
		C { c	1	1	1	1	4	1	1	1	1	1	5
		D { d	1	1	1	1	4	1	1	1	1	1	5
		E { e	1	1	1	1	4	1	1	1	1	1	5
		F { f	1	1	1	1	4	1	1	1	1	1	5
		G { g	1	1	1	1	4	1	1	1	1	1	5
		H { h	1	1	1	1	4	1	1	1	1	1	5
		I { i	1	1	1	1	4	1	1	1	1	1	5
		J { j	1	1	1	1	4	1	1	1	1	1	5
	3	A { a	1	1	1	1	4	1	1	1	1	1	5
		B { b	1	1	1	1	4	1	1	1	1	1	5
		C { c	1	1	1	1	4	1	1	1	1	1	5
		D { d	1	1	1	1	4	1	1	1	1	1	5
		E { e	1	1	1	1	4	1	1	1	1	1	5
		F { f	1	1	1	1	4	1	1	1	1	1	5
		G { g	1	1	1	1	4	1	1	1	1	1	5
		H { h	1	1	1	1	4	1	1	1	1	1	5
		I { i	1	1	1	1	4	1	1	1	1	1	5
		J { j	1	1	1	1	4	1	1	1	1	1	5

These results seemed to me distinctly promising in the search for a diagnostic test. It will be noted that I have included no results in which there was not an absolute difference of at least 5, and a proportional difference of at least 50% (larger number half again as large as smaller number). In every case but the first one, the larger number is more than twice as great as the smaller. I now applied the same method of classification to the reactions which were not repeated,—the associates given in either trial 1 or trial 2, but not both. This meant the classification of about 1,200 more associations. (The average number of repetitions being 40, the average number of non-repeated associations from one subject is $200 - [40 \times 2] = 120$). I give below the *sum* of the results for repeated and non-repeated associations. The results for the repeated associations were of course doubled before being added to the others.

The following results are apparent:

(a) Every one of the four classes in space-contiguity and of the three in time-contiguity shows a balance in favor of Group A. The total number of contiguity-associations is, for Group A, 175, for Group B, 91.

(b) The number of synonyms is about the same for the two groups, this applying to the separate classes as well as to the total number of synonyms.

(c) Group B has 91 reactions of "members of a class having something in common with the stimulus;" Group A has but 54.

(d) Group B gives 132 exact opposites to 66 for Group A, just twice as many, and 34 approximate opposites to Group A's 9,—a total of 166 to 75.

(e) Group B gives 62 "members of a common pair associated by similarity;" Group A, 22.

(f) Group A leads by a good margin in "subordination," having 44 to 25 for Group B, and in

(g) "Supraordination," having 23 to Group B's 13.

(h) When adjective-stimuli are given, literary subjects are much more likely to give an answer naming something appropriate to that adjective; the numbers are 49 to 23, respectively.

(i) On the other hand, when noun-stimuli are given, scientific subjects are much more likely to delimit it by an adjective (22 to 5),

(j) And they are more likely to select an essential attribute (19 to 11).

(k) Literary subjects give more nouns as the subjects of stimulus-verbs (27 to 19).

		GROUP A					GROUP B								
		J.C.A.	T.B.	L.S.M.	W.L.P.	C.B.T.	Totals	G.A.B.	H.A.B.	R.C.T.	W.A.W.	L.L.W.	Totals		
I	1	A a	9	15	15	10	13	62	13	3	5	12	6	39	
		B b	12	14	6	9	19	60	11	7	10	5	4	37	
		C c	7	7	5	3	4	19	1	1	2	1	4	5	
		D d	10	9	9	1	20	3	3	..	..	1	4	4
		E e	4	3	3	2	6	..	..	..	..	..	2	0
		F f	11	7	5	13	16	52	4	16	5	11	14	50	
		G g	15	25	7	19	12	78	12	13	9	13	24	71	
		H h	11	4	2	8	9	34	6	5	5	8	1	31	
		I i	4	5	3	2	13	3	3	1	1	3	7	11	
		J j	2	3	..	1	10	1	1	2	3	3	7	7	
	2	A a	11	13	7	17	54	9	25	4	16	37	91	91	
		B b	6	3	4	15	16	6	6	20	1	3	10	10	
		C c	14	10	2	15	25	66	41	10	20	27	132	132	
		D d	2	2	1	4	9	9	10	6	6	6	34	34	
		E e	4	3	4	3	4	18	..	..	..	..	15	15
		F f	5	4	4	6	22	9	21	10	9	9	62	62	
		G g	11	10	13	11	44	5	6	5	4	5	25	25	
		H h	6	6	1	3	23	..	4	4	2	1	13	13	
		I i	2	1	..	..	2	..	3	2	..	..	3	4
		J j	7	1	3	..	12	..	3	3	6	4	27	27	
	3	A a	3	3	7	10	33	7	3	6	5	7	23	23	
		B b	8	14	18	9	49	10	2	3	3	3	9	9	
		C c	9	2	1	..	1	4	1	1	3	..	3	3	
		D d	10	1	1	3	15	5	2	..	1	..	15	15	
		E e	11	1	1	2	..	..	16	4	..	..	22	22
		F f	12	..	..	..	3	..	..	..	3	..	0	0
		G g	13	..	..	2	..	..	..	..	..	..	0	0
		H h	2	..	1	4	9	1	5	3	7	1	16	16	
		I i	1	..	..	..	1	1	1	..	1	..	3	3
		J j	2	2	..	..	4	5	..	1	..	..	5	5
	4	A a	1	1	1	3	1	..	2	2
		B b	2	2	0	7	1	2	10	10
		C c	5	11	13	9	10	48	10	5	14	7	4	40	40
		D d	1	1	2	0	0
		E e	2	4	11	5	5	27	2	3	6	6	2	19	19
		F f	2	2	1	..	5	..	2	0	0	0
		G g	1	1	..	2	4	0	0	0
		H h	1	1	3	1	1	1	1
		I i	3	..	0	0	0	0
		J j	..	1	1	..	2	2	2	1	1	..	4	4	4
	5	A a	1	..	1	0	0	0
		B b	1	0	0	0
		C c	1	2	..	1	1	..	4	4
		D d	0	0
		E e	0	0
		F f	0	0
G g		..	..	..	..	..	..	..	..	..	..	..	0	0
H h		..	..	..	..	..	..	..	..	..	..	..	0	0
I i		..	..	..	..	..	..	..	..	..	..	..	0	0
J j		..	..	..	..	..	..	..	..	..	..	..	0	0
6	A a	7	1	6	..	1	14	9	3	8	6	3	29	29	
	B b	1	..	1	..	2	1	..	2	..	..	..	4	4
	C c	1	..	..	..	0	0	..	..	..	..	..	0	0
	D d	2	..	..	..	0	0	..	2	..	2	4	4	4
	E e	2	1	3	..	6	2	1	..	..	1	1	1	1
	F f	..	..	..	..	0	0	..	..	..	..	..	0	0
	G g	..	..	..	..	0	0	..	..	..	..	..	0	0
	H h	..	..	..	..	0	0	..	..	..	..	..	0	0
	I i	..	..	..	..	0	0	..	..	..	..	..	0	0
	J j	..	..	..	..	0	0	..	..	..	..	..	0	0
7	A a	34	11	33	19	14	111	16	15	28	19	15	93	93	

(1) Scientific subjects give over twice as many "word-contiguity" associations completing a phrase (29 to 14),—the commonest class of the pure verbal combinations.

Although I have drawn no conclusions except where there were considerable margins, I think conclusions (g), (i), (j), and (k) above had better be thrown out, because the variation within the group is so large in comparison with the difference between the group-averages. The others, except of course (b), are, I believe, clear-cut differences between the types, large enough to be of value in establishing group-differences. The following is an application of these results to the ten subjects, to find how good a diagnostic test we have here. "a" and "t" are again used as markers, the criterion being as follows: a geometrical mean is taken between the two group-averages; if the difference between the subject's rating and this mean is less than 10% of the magnitude of the latter, he is called undecided; if he varies more than this he is marked on the basis of the direction of his variation, whether toward his group or away from it. If Group A averages 20, and Group B 80, a literary subject less than 36 is typical, from 36 to 44 undecided, above 44 atypical. The headings of the columns below refer to the conclusions as to group-differences which we have just drawn.

Group A	(a)	(c)	(d)	(e)	(f)	(h)	(1)	Net results
J.C.A.....	a	t	t	t	a	a	a	atypical
T.B.....	t	—	t	t	t	t	t	typical
L.S.M.....	t	t	t	t	t	t	a	typical
W.L.P.....	—	a	t	t	t	t	t	typical
C.B.T.....	t	t	a	t	t	—	t	typical
Group B								
G.A.B.....	a	a	a	t	t	a	t	atypical
H.A.B.....	t	t	t	t	—	t	a	typical
R.C.T.....	t	a	—	t	t	t	t	typical
W.A.W.....	t	t	t	t	t	—	t	typical
L.L.W.....	t	t	t	t	t	t	a	typical

Here we have eight subjects typical, two atypical, and these two only by a margin of four atypical to three typical characters. But of course the test is unsatisfactory as long as it makes two subjects out of ten atypical. I therefore decided to amend it by omitting any characteristics which showed more than three atypical subjects out of ten. This means throwing out the last one, column (1). By doing so we find J.C.A. of undecided status, 3 to 3, and G.A.B. still atypical. But it means that not a single other subject has more than one atypical characteristic out of six, and five

have no atypical characteristics. Class (e), "members of a common pair associated by similarity," gives us "typical" in all ten subjects; it is therefore the best diagnostic test we have yet encountered. Class (f), "subordination," gives eight typical, one atypical, and one undecided. The application of these two criteria alone would give us nine typical subjects, and one undecided,—J.C.A., whom we found to be the one atypical subject in our classification on the basis of the parts of speech.

Some experimenters have gone into the matter of reactions by proper names, and have attached considerable significance to such reactions. This method was applied to Groups A and B, with these results:

Signification of proper name								
	Per- sons	Na- tions	Ci- ties	Places not cities	Times	Physi- cal things	Misc.	Total
Group A								
J.C.A. . .	0	0	0	0	0	0	0	0
T.B. . . .	0	0	1	1	2	0	0	4
L.S.M. . .	8	0	3	9	2	1	0	23
W.L.P. . .	1	0	0	0	0	1	0	2
C.B.T. . .	1	0	0	1	0	0	1	3
Totals.	10	0	4	11	4	2	1	32
Group B								
G.A.B. . .	3	0	2	0	0	1	0	6
H.A.B. . .	0	1	0	0	0	0	0	1
R.C.T. . .	1	0	0	0	0	0	1	2
W.A.W. . .	0	0	0	0	0	0	0	0
L.L.W. . .	0	0	0	0	0	0	0	0
Totals.	4	1	2	0	0	1	1	9

Though we have of course no diagnostic character here, the great mass of proper names from L. S. M., who has been so distinctly typical heretofore, made me think it worth while to try this method with the other subjects. The totals for the groups were as follows:

Signification of proper name								
	Per- sons	Na- tions	Ci- ties	Places not cities	Times	Physi- cal things	Misc.	Totals
Literary . . .	32	0	0	12	1	0	7	52
Scientific. .	11	2	1	11	3	0	5	33

With *ten* literary subjects giving 53 proper names to 33 for *seventeen* scientific subjects,—an average per person of

5.2 against 2.0, there seems no question that we have a real difference in group-tendencies. The personal variation is too large to make the test of great value in individual cases, however clear the results might be as to the groups. A glance at the results shows that the difference between the groups lies in the proper names which refer to *persons*, the others being about equally distributed between the two groups. I therefore set out to see whether the literary subjects gave more reactions-in-general referring to persons, aside from proper-name answers. Do they use many words like *soldier*, *baby*, *architect*, *mother*,—words signifying *people*? This study was made first by means of the associations from adjective-stimuli,—to see whether adjectives given were made by the subject to refer to persons or things. I did not get enough material here to justify any conclusions, so I undertook the matter on a larger scale, counting all the common-noun reactions from Groups A and B. The results:

	Signification of noun						
	Physi- cal things	Non- physi- cal	Numer- als	Ab- stract nouns	Human beings	Ani- mals	Unclass- ified
Group A							
J.C.A.	29	9	0	2	4	5	0
T.B.	38	12	1	0	7	3	1
L.S.M.	36	7	1	1	14	2	0
W.L.P.	39	8	0	1	11	4	1
C.B.T.	46	17	1	1	3	3	3
Totals.	188	53	3	5	39	17	5
Group B							
G.A.B.	31	9	0	1	10	3	2
H.A.B.	33	11	0	2	7	1	0
R.C.T.	39	5	0	1	9	0	2
W.A.W.	38	14	0	1	7	4	1
L.L.W.	31	12	0	2	5	3	0
Total.	172	51	0	7	38	11	5

A fine case of absolutely negative results. Apparently the tendency to refer to *persons*, which characterizes Group A, is limited to *particular persons*, for the *common-noun* reactions which refer to persons are evenly distributed.

Jung speaks of predicate-types and definition-types;³⁰ the former react to stimuli emotionally, the latter intellectually. He considers the types well-defined and permanent,—that is, the members of a type stay in that type on all trials. The

³⁰ American Journal of Psychology, Vol. 21, April, 1910.

Kent-Rosanoff experiment yielded some very interesting results in this field, but the experimenters were not sure as to the permanence of the types,—whether individuals would show the same tendencies in later trials. It seemed to me that Jung was probably right, and that there might be something here of value for my purposes; it might be that the literary people, interested in aesthetic and emotional things, would tend toward predicates, and the scientists, interested in factual things, toward definitions. I found to my surprise that on this basis all my subjects were scientists,—all had more definitions than predicates, and actually the *scientists* had more *predicates* than the literary people. Though the results throw no light on my problem, they are interesting as showing extreme personal variation in the number of predicates.

Total definitions (All synonyms, plus supra-ordination)		Total predicates (Classes I-11 and I-14)	
Group A	Group B	Group A	Group B
J.C.A. 54	G.A.B. 26	J.C.A. 6	G.A.B. 8
T.B. 50	H.A.B. 40	T.B. 0	H.A.B. 3
L.S.M. 16	R.C.T. 26	L.S.M. 4	R.C.T. 24
W.L.P. 46	W.A.W. 40	W.L.P. 6	W.A.W. 9
C.B.T. 44	L.L.W. 51	C.B.T. 3	L.L.W. 0
Totals. . . 210	183	19	44
		Mean var. 1.6	Mean var. 6.16

Jung is therefore of no help to us in this experiment. But that there is such a thing as a predicate-type may, I think, be inferred from a glance at R.C.T.'s results! Of these 24, 11 were given on the first trial, 13 on the second, so that the characteristic does not appear to be a temporary variation.

Some of our methods have proved successful, others have not. To establish just how far we have gone towards the formulation of a genuine diagnostic test for literary and scientific types, I classify the ten members of Groups A and B in each respect in which we have thought definite conclusions justifiable as to type differences (except the matter of proper-names), using again the criterion of "typical" vs. "atypical."

	Parts of speech			Meaning-relation							Repetitions ^{a1}	Av. of community ^{a1}	Totals		
	Noun-stim.	Adj.-stim.	Verb-stim.	(a)	(c)	(d)	(e)	(f)	(h)	t			a	—	
J.C.A. . . .	—	a	a	a	t	t	t	a	a	t	t	5	5	1	
T.B.	t	t	—	t	—	t	t	t	t	t	t	9	0	2	
L.S.M. . . .	t	t	t	t	t	t	t	t	t	t	t	11	0	0	
W.L.P. . . .	—	t	t	—	a	t	t	t	t	t	t	8	1	2	
C.B.T. . . .	t	a	t	t	t	a	t	t	—	a	a	6	4	1	
G.A.B. . . .	t	a	t	a	a	a	t	t	a	t	t	6	5	0	
H.A.B. . . .	a	t	t	t	t	t	t	—	t	t	t	9	1	1	
R.C.T. . . .	t	t	a	t	a	—	t	t	t	a	a	6	4	1	
W.A.W. . . .	t	a	t	t	t	t	t	t	—	t	t	9	1	1	
L.L.W. . . .	a	t	t	t	t	t	t	t	t	t	t	10	1	0	
Totals for <i>typical</i> and <i>atypical</i>												79	22	9	

This makes J.C.A. undecided and leaves G.A.B. just over the edge on the typical side. We have nine typical subjects and one undecided. I think we have made some progress towards a diagnostic test.³² We could improve this by leaving out the second column, which has four atypical subjects, only one other column having as many as three. We get the following scores:

	t	a	—		t	a	—
J.C.A.	5	4	1	G.A.B.	6	4	0
T.B.	8	0	2	H.A.B.	8	1	1
L.S.M.	10	0	0	R.C.T.	5	4	1
W.L.P.	7	1	2	W.A.W.	9	0	1
C.B.T.	6	3	1	L.L.W.	9	1	0

These ten criteria therefore give *every* subject as typical. Of course, to make sure that we have a real criterion we ought to proceed to apply this to a number of other subjects. Because of the length of time this would involve, it has not yet been undertaken.

In closing, I give a summary of what seem to me the out-

³¹ In the results from these two methods the group averages are much nearer together than those obtained by other methods. For this reason absolute variation on either side of the geometric mean, without the use of a margin, has determined whether a subject is "typical" or "atypical."

³² A good diagnostic procedure would be to try a subject in (e) and (f) of meaning-relations (see page 255), and if these results did not agree as to his status, try the other criteria.

standing positive results of the experiment. Where the results are not decided enough to make conclusions absolutely *sure*, yet seem to make the correctness of the conclusions *very probable*, I have added a question-mark in parentheses.

(1) Scientific subjects tend to give more repetitions than literary subjects. (?)

(2) Scientific subjects tend to greater "community." (?)

(3) Literary subjects tend to give more proper names of persons.

(4) When noun-stimuli are given, scientific subjects give more adjective-reactions.

(5) When adjective-stimuli are given, literary subjects give more noun-reactions. (?)

(6) When verb-stimuli are given, scientific subjects give more verb-reactions, fewer noun-reactions, than literary subjects.

(7) Literary subjects give more associations by contiguity.⁸³

(8) Scientific subjects give more opposites.

(9) Scientific subjects give many more "members of a common pair associated by similarity;" and this appears to be a good diagnostic character for a test of subjects.

I believe, however, that the classification of associations which has been worked out for the purposes of this experiment is of more value than any results here obtained; and any claims this experiment has to being considered worth while rest not so much on the conclusions as to literary and scientific types as on the *instrument for future work* which it has suggested,—the new classification of associations, which has been at once the most arduous and the most interesting phase of the experiment.

⁸³ In sense defined on p. (248), foot-note 12.